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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/829,306	04/20/2004	Shinsuke Fujiwara	4685	5680

21553 7590 08/31/2006

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EXAMINER

ARENA, ANDREW OWENS

ART UNIT	PAPER NUMBER
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2811

DATE MAILED: 08/31/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/829,306	FUJIWARA ET AL.	
	Examiner	Art Unit	
	Andrew O. Arena	2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 June 2006 and 25 May 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-7 and 11-15 is/are pending in the application.
- 4a) Of the above claim(s) 2,7,14 and 15 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 3-6, and 11-13 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 April 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- ☒ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>4/20/04 & 10/10/05</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 05/25/2006 has been entered.

Specification

The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: Group II-VI light emitting device comprising ZnMgBeSe barrier layer directly between active and p-clad layers.

The specification is objected to because of the following informalities:

the discussion of the alternate barrier layers (pg 11 ln 7-10) refers to Fig 2 (ln 8) and should also explicitly refer to Fig 3 (after "used" on ln 9) for clarity and consistency;

the recitation "sell" (pg 12 ln 12) should recite "cell";

the recitation "contact layer 8" (pg 13 ln 26) contradicts references to the same as "contact layer 7" (pg 11 ln 12 and Figs 1, 7, 9, 10, 14, and 17);

the recitation "band gap of trap layer 12 have only to be larger than tat of the p-type cladding layer" (pg 16 ln 8-9) contradicts Fig 8 (p-type cladding is 5, pg 16 ln 2);

the recitation "ZnCdSe/ZnSe" (pg 17 ln 11) contradicts references to the same as "ZnCd/ZnSe" (pg 15 ln 3-4 and Figs 7, 9, 10, 14, and 17).

Appropriate correction is required.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action (dated 01/26/2006).

Claims 1, 3-6, 11, and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Migita (US 5,299,217) in view of Asryan (US 6,870,178) and Duggan (US 5,747,827).

Regarding claim 1, Migita discloses (Fig 5) a semiconductor light emitting device of II-VI group compound semiconductor (col 2 ln 48-55) formed on a compound semiconductor substrate (ZnSe: col 3 ln 48) and comprising an active layer (22) between an n-type cladding layer (21) and a p-type cladding layer (23; col 7 ln 35-37).

Migita differs from the claimed invention only in not disclosing a barrier layer.

Asryan discloses (Fig 8) a semiconductor light emitting device of a compound semiconductor comprising an i-type semiconductor barrier layer (116; col 2 ln 57) consisting of a single monolayer of an i-type semiconductor material (col 13 ln 39-42: Table II indicates only the cladding layers are doped) having a band gap larger than a

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band gap of a p-type cladding layer (Fig 8 and Table I in col 13), provided between an active layer (110) and a p-type cladding layer (122).

Duggan discloses a semiconductor light emitting device of a compound semiconductor, teaches II-VI and III-IV systems are art-equivalents suitable for blue LEDs and LDs (col 1 ln 12-13, col 4 ln 44-46 & 66, col 5 ln 1-2), and teaches (Fig 23) a barrier layer (58) between and respectively directly in contact with an active layer (62) and a p-type cladding layer (64) in a II-VI-based light emitting device (col 11 ln 9-14).

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify Migita in view of Asryan and Duggan to further comprise an i-type semiconductor barrier layer consisting of a single monolayer of an i-type semiconductor material having a band gap larger than a band gap of said p-type cladding layer, provided between said active layer and said p-type cladding layer; at least to suppress electron overflow (Duggan: col 11 ln 29).

Regarding claim 3, Migita as modified above differs from the claimed invention only in not expressly disclosing the magnitude of said band gap difference.

Asryan discloses (Table I, col 13) the claimed band gap difference.

It would have been obvious to a person having ordinary skill in the art at the time the invention was made that the magnitude of the band gap of said barrier layer is larger by 0.05 eV than the band gap of said p-type cladding layer; at least use a known and suitable magnitude.

Regarding claim 4, Migita as modified above differs from the claimed invention only in not expressly disclosing the energy band diagram.

Asryan discloses (Fig 8) the claimed energy band relationships.

It would have been obvious to a person having ordinary skill in the art at the time the invention was made that in the band gap of said barrier layer, energy of valence band (808) is approximately the same as or higher than that (182 at 126 in layer 122) of said p-type cladding layer, and energy of conductive band (804) is larger than that (182 at 124 in layer 122) of said p-type cladding layer; at least to use a known and suitable energy band relationship.

Regarding claims 5 & 6, Migita as modified above discloses said barrier layer is of a II-VI group semiconductor.

Migita as modified above differs from the claimed invention only in not expressly disclosing the material of the barrier layer.

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to form the barrier layer using ZnMgBeSe; at least to use a known and suitable material.

Regarding claim 11, Migita discloses said p-type cladding layer is ZnCdS.

Migita as modified above differs from the claimed invention only in not disclosing said p-type cladding includes Mg and Se.

Duggan teaches the use of II-VI compounds including Zn, Mg, S, and Se such as ZnSeS-MgSSe.

It would have been obvious to a person having ordinary skill in the art at the time the invention was made that said p-type cladding layer is formed of ZnCdMgSSe; at least to use a known and suitable material.

Regarding claim 13, Migita discloses (Fig 3) an n-type ZnSe single crystal substrate is used as said compound semiconductor substrate (col 2 ln 48-50).

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Migita as modified for claim 1 above, and further in view of Domen (US 6,555,403).

Regarding claim 12, Migita as modified above differs from the claimed invention only in not expressly disclosing thickness of said barrier layer.

Domen discloses a semiconductor light emitting device and teaches thickness of said barrier layer (col 53 ln 47-48, 56, 60, 63) is at least 5 nm and at most thickness of said active layer (col 52 ln 27-31).

It would have been obvious to a person having ordinary skill in the art at the time the invention was made that thickness of said barrier layer is at least 5 nm and at most thickness of said active layer; at least to use a know and suitable thickness.

Response to Arguments

Applicant's arguments filed 05/25/2006 have been considered but are moot in view of the new grounds of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andrew O. Arena whose telephone number is (571) 272-5976. The examiner can normally be reached on M-F 8:30-5.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Lee can be reached on (571) 272-1732. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Andrew O Arena
25 August 2006

A handwritten signature in black ink, appearing to read 'Eddie Lee', with a large, sweeping initial 'E'.

EDDIE LEE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800